SUCCESSFUL HOOKWORM CONTROL WITH CHENOPODIUM-CARBON TETRACHLORIDE*

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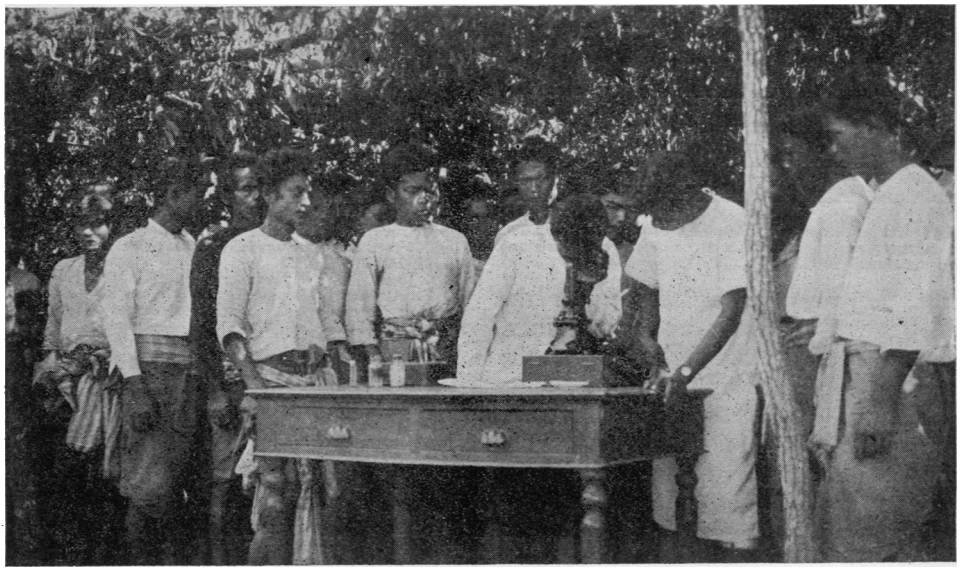
IT IS NOW four years since Hall[1] called attention to the value of carbon tetrachloride as an anthelmintic. The suggestion was at once caught up, and a succession of investigators have worked out the properties of this drug, both in the laboratory, with the help of dogs and other animals, and in the hospital, where a small number of patients under control could be treated and observed. Egg counts, worm counts, symptoms, and autopsies have all contributed their information, until today we have a mass of information about carbon tetrachloride, its dosage, efficiency, and toxicity.

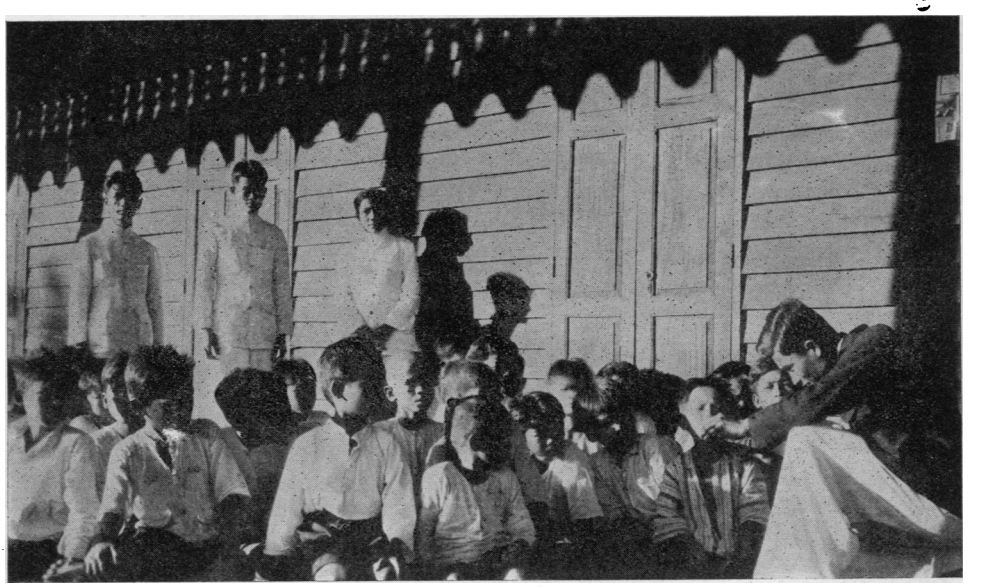
This information is of value to two classes of men, the private practitioner and the public health official. The private practitioner or hospital physician treats but one or two people at a time, individuals whom he has completely under his observation and control. The qualities he especially desires in an anthelmintic are comfort and efficiency. The public health official has another problem. He must control infection in a whole population, by the treatment of large numbers of people. To do this he must frequently use non-medical men as dispensers, for an adequate supply of doctors is not available or is too expensive. For him the successful anthelmintic must have not only the two qualities mentioned above,



EXAMINING HOOKWORM LARVAE

* The observations which form the basis of this paper were conducted with the support and under the auspices of the International Health Board of the Rockefeller Foundation.

but also those of economy, and, above all, of safety. In addition, it must deal adequately with the mixed infection which is usually present. Today he is studying the claims of carbon tetrachloride in the reports of the laboratory and hospital workers, and he asks the final question:



SCHOOLBOYS TAKING HOOKWORM MEDICINE

"How does it work in the field, in mass treatments?" The first answer to this was furnished by Lambert [2] in his report of 50,000 treatments in Fiji, with three deaths. This paper reports further experience in another tropical field, on a still more extended scale.

THE HOOKWORM CAMPAIGN IN SIAM

For some years past the International Health Board has coöperated with governmental and other agencies in Siam in carrying on a campaign for the control of hookworm and other intestinal parasites, on the plan of mass therapy (sanitary improvement, of course, forming a phase of the work). Areas were selected because of their high infection rate, and treatments were given without individual examination to every able-bodied person who could be induced to present himself. Various drugs were used; but since May, 1923, by far the greatest number of treatments have been given with a mixture of chenopodium (40 per cent) and carbon tetrachloride (60 per cent). This mixture combined the enfficiency of carbon tetrachloride in dealing with hookworms and the virtues of chenopodium in removing other parasites present. The dilution with carbon tetrachloride served to lessen the discomfort of taking. The mixture was also considerably cheaper than chenopodium alone.

Every precaution was taken to guard the purity of the drugs. "Chemically pure" carbon tetrachloride was purchased in New York, but before being used was retested in the Government Laboratory in Bangkok, and when necessary redistilled and repurified. The chenopodium used was the standard article of good quality available in New York. The mixture was prepared by the field men by adding the measured volumes in quantities sufficient for several days' treatments. Just what deterioration takes place in the mixture on standing we do not know as yet, but instructions were issued to mix enough for only 3 to 4 days at a time.

Each field unit was composed of one Siamese physician and five or six dispensers. The latter were men of limited education, few of them having completed grade school; their training was also limited. But it is felt that so far as their background and training extended, they were able and conscientious men. These dispensers were scattered in villages about the county seat, and were frequently removed from their medical officer by several hours travel. They were thus thrown much on their own responsibility, both in conducting treatments and in dealing with any complications that arose.

HOOKWORM LECTURES BENEATH A SACRED BO TREE TEMPLE

PROCEDURE

The maximum dosage used was 2.0 c.c. of the mixture. This was less than has been employed in some other countries, but the Siamese are a small people, and in an extended campaign a conservative dose seemed the wisest. The following routine was observed in giving treatments:

1. The patient appeared without breakfast.
2. At 7:00 A.M. he was given half the dose of the mixture.
3. At 8:00 he took the remainder.
4. At 9:00 he drank an ounce of magnesium sulphate in hot water.
5. He was then dismissed with the warning not to take food until after his bowels had moved.

In the case of a child fifteen years old or younger, the dose was two drops of the mixture for each year of apparent age, taken at one time in castor oil. Dispensers were directed to turn away applicants with tuberculosis, heart or kidney disease (giving them simple instructions in the more evident signs), those with acute conditions, and pregnant women.

RESULTS OF THIS SERIES OF TREATMENTS

The active use of this mixture of chenopodium and carbon tetrachloride in Siam began in May, 1923. Between that date and September 1, 1924, more than 225,000 individuals were treated with the mixture. This number is exclusive of cases in which for some reason other drugs were employed. It constitutes what is believed to be the largest series yet reported in which carbon tetrachloride was used.

In such a campaign a fatality is a thing most to be feared, not only in itself, but also in its effect on public sentiment. In connection with all these treatments with this drug, only three deaths were reported which on investigation were found to have any connection with the campaign treatment. Three others occurred, but of these one was a fractured skull in an old man who fell off a porch after treatment, one was a case of miliary tuberculosis (confirmed by post-mortem and examination of sections of liver), and the third was a case of overdose, a curious boy snatching a bottle and swallowing a mouthful of the mixture.

At the same time that this work was being carried on, Smillie and Pessoa[3] were finding that a dose of 2.0 c.c. of carbon tetrachloride (80 per cent), and of ascaridol, the purified constituent of oil of chenopodium (20 per cent), is "highly efficient, comparatively nontoxic, easy to administer, and inexpensive." The work in Siam, in which a similar mixture was used under remote campaign conditions, furnishes the field test. That we can report but three deaths in treating so large a number with this mixture should be a satisfactory and reassuring answer to the questions of public health workers elsewhere.

SUMMARY

1. A standard dose (2.0 c.c. maximum) of carbon tetrachloride (60 per cent) and oil of chenopodium (40 per cent) was used in a mass therapy campaign in Siam.

2. A total of 225,000 individuals were treated with this up to September 1, 1924, with three deaths.

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BACTERIOLOGICAL DATA ON THE CHLORINE TREATMENT OF RESPIRATORY DISEASES*

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THIS PAPER is a summary of the results of bacteriological studies of the recently proposed chlorine treatment for respiratory diseases. It is part of a combined clinical and laboratory investigation which has been carried on by a Board of Officers for nearly a year at the Army Medical School and Walter Reed Hospital, of the recently organized Army Medical Center.

This work has consisted of two parts: First, that done in a chamber with the early portable apparatus, which was carried out by Nichols and Hitchens; second, the work with the individual apparatus which has been done by Nichols and Simmons. The results with both methods are essentially the same, however, and in brief, according to our experience, do not furnish any bactericidal basis for the use of these methods.

The rationale of the chlorine treatment was at first said to be the bactericidal action of the gas and it was claimed that the flora of the nose and throat was remarkably reduced by one hour's treat-

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